

FAILURE MODES EFFECTS ANALYSIS (FMEA) - CIL HARDWARE
 NUMBER:05-1-FC6242 -X

SUBSYSTEM NAME: GUIDANCE, NAVIGATION, & CONTROL

REVISION: 0 06/28/88

PART DATA

PART NAME	PART NUMBER
VENDOR NAME	VENDOR NUMBER
LRU :REACTION JET DRIVER FWD	MC621-0043-6244

EXTENDED DESCRIPTION OF PART UNDER ANALYSIS:
 REACTION JET DRIVER FORWARD (RJDF).

REFERENCE DESIGNATORS: 81V79A8
 82V79A9

QUANTITY OF LIKE ITEMS: 2
 TWO REQUIRED. EACH DRIVES EIGHT THRUSTERS.

FUNCTION:
 PROVIDES THE ELECTRONIC CIRCUITRY NECESSARY TO DECODE COMMANDS
 RECEIVED THROUGH THE MDM'S AND DRIVES THE APPROPRIATE REACTION JET
 SOLENOIDS. PROVIDES SIGNALS TO THE DPS FOR REDUNDANCY MANAGEMENT
 FUNCTIONS.

FAILURE MODES EFFECTS ANALYSIS FMEA - CIL FAILURE MODE

NUMBER: 05-1-FC6242-01

REVISION#: 1 01/22/96

SUBSYSTEM NAME: GUIDANCE, NAVIGATION, & CONTROL

LRU: REACTION JET DRIVER FWD

CRITICALITY OF THIS

ITEM NAME: REACTION JET DRIVER FWD

FAILURE MODE: 1R2

FAILURE MODE:

LOSS OF OUTPUT TO ONE OR MORE JETS

MISSION PHASE:

LO LIFT-OFF
DO DE-ORBIT

VEHICLE/PAYLOAD/KIT EFFECTIVITY:

102 COLUMBIA
103 DISCOVERY
104 ATLANTIS
105 ENDEAVOUR

CAUSE:

VIBRATION, TEMPERATURE, CONTAMINATION, MISHANDLING/ABUSE, MECHANICAL SHOCK, THERMAL SHOCK, PIECE PART FAILURE.

CRITICALITY 1/1 DURING INTACT ABORT ONLY? NO

REDUNDANCY SCREEN

A) PASS
B) PASS
C) PASS

PASS/FAIL RATIONALE:

A)

B)

C)

- FAILURE EFFECTS -

(A) SUBSYSTEM:

NO EFFECT FOR FIRST FAILURE, LOSS OF ONE HALF OF ONE RJDF ASSEMBLY.

(B) INTERFACING SUBSYSTEM(S):

SAME AS (A)

(C) MISSION:

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POSSIBLE MISSION IMPACT DUE TO LOSS OF ONE OF TWO VERNIER RCS FORWARD JETS.

(D) CREW, VEHICLE, AND ELEMENT(S):

NO EFFECT FOR FIRST FAILURE. SECOND FAILURE REDUCES RCS CONTROL AUTHORITY BELOW THE MINIMUM SAFETY LEVEL REQUIRED FOR RTLS, ET-SEPARATION. IN ADDITION, CAUSES LOSS OF FORWARD RCS DUMP CAPABILITY IF SECOND JET LOSS IS ON SAME SIDE (C.G. AND VEHICLE WEIGHT UNACCEPTABLE FOR LANDING).

(E) FUNCTIONAL CRITICALITY EFFECTS:

CRITICALITY 1R BECAUSE LOSS OF STABILITY CONTROL MAY CAUSE LOSS OF VEHICLE.

-DISPOSITION RATIONALE-

(A) DESIGN:

ALL ELECTRICAL, ELECTRONIC, AND ELECTROMECHANICAL (EEE) PIECE PARTS WHICH MAKE UP THE RJDF ARE CONTROLLED TO THE ORBITER PROJECT PARTS LIST (OPPL) REQUIREMENTS OF MF0004-400. PASSIVE EEE PARTS AND ELECTRICAL CONNECTORS ARE MILITARY QUALIFIED AND 100% SCREENED TO OPPL REQUIREMENTS. MICROCIRCUITS ARE QUALIFIED TO MIL-M-38510 AND SCREENED TO MIL-S-883, LEVEL B. SEMICONDUCTOR DEVICES ARE JANTXV LEVEL. CIRCUIT DESIGN LIMITS WORST CASE JUNCTION TEMPERATURES TO 95°C AND ELECTRICAL STRESSES TO 50% OF RATED CAPABILITY FOR ALL PARTS. THE RJDF AS AN ASSEMBLY HAS A CERTIFIED LIFE OF 10,000 HOURS (100 MISSIONS) EQUIVALENT TO TEN YEARS.

THE RJDF IS DESIGNED AS A HERMETICALLY SEALED UNIT TO PREVENT OR ELIMINATE THE ENVIRONMENTAL EFFECTS OF RAIN, SAND, DUST, AS WELL AS MOISTURE. INTERNAL COMPONENTS ARE CONFORMAL COATED TO ELIMINATE THE ADVERSE EFFECTS OF MOISTURE, PRESSURE, AND/OR TEMPERATURE VARIATIONS IN ADDITION TO SHORT CIRCUIT PROTECTION. THE RJDF ALSO INCORPORATES A BUILT IN TEST EQUIPMENT (BITE) CIRCUIT TO INDICATE JET COMMAND *ON* VS *OFF* STATUS.

(B) TEST:

ACCEPTANCE TESTING, WHICH INCLUDES ACCEPTANCE THERMAL TESTING (ATT) AND ACCEPTANCE VIBRATION TESTING (AVT), IS PERFORMED ON EACH UNIT. QUALIFICATION TESTING, INCLUDING VIBRATION, SHOCK, TEMPERATURE, HAS BEEN PERFORMED TO CERTIFY THE DESIGN. INTEGRATED/SUBSYSTEM VERIFICATION IS PERFORMED DURING TURNAROUND. FUNCTIONAL TEST IS MONITORED TO DETECT LOSS OF OUTPUT.

(C) INSPECTION:

RECEIVING INSPECTION
INCOMING MATERIAL IS VERIFIED BY RECEIVING INSPECTION.

CONTAMINATION CONTROL
FINAL ASSEMBLY AND REWORK PERFORMED IN A CLEAN ROOM AND MONITORED BY INSPECTION.

ASSEMBLY/INSTALLATION

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QUALITY PLANNING ENSURES ALL DRAWING AND PROCUREMENT REQUIREMENTS ARE PUT INTO IN-PROCESS WORK TICKETS. ALL ASSEMBLY BENCHES ARE EQUIPPED WITH GROUNDING STRAPS AND BENCH COVERS. TORQUING VERIFICATION BY INSPECTION.

NONDESTRUCTIVE EVALUATION
 RADIOGRAPHIC ANALYSIS, ULTRASONIC TESTING, DYE PENETRANT AND MAGNETIC PARTICLE ANALYSIS VERIFIED BY INSPECTION.

CRITICAL PROCESSES
 POTTING, BONDING, FUSION WELDING, SOLDERING AND MATERIAL CLEANING VERIFIED BY INSPECTION.

TESTING
 ENVIRONMENTAL ACCEPTANCE TESTING IS OBSERVED AND VERIFIED BY QUALITY CONTROL.

HANDLING/ PACKAGING
 THE PACKING AND PACKAGING REQUIREMENTS ARE SATISFIED BY USE OF SPECIAL QUALIFIED CONTAINERS FOR IN-PLANT TRANSPORTATION AND SHIPPING. RETURNED AND ACCEPTED GOODS ARE STORED IN A BONDED AREA.

(D) FAILURE HISTORY:

AC5272 (ATP) DURING THERMAL TEST, THE RJDF POWER SUPPLY FAILED. IT WAS DETERMINED THAT THE FAILURE COULD RESULT IN THE LOSS OF 1/2 OF THE RJDF. COMPONENT LEVEL FAILURE ANALYSIS ISOLATED THE FAILURE TO A JANTX2N3501 TRANSISTOR. AS A REPAIR ACTION THE POWER SUPPLY WAS REPLACED. CORRECTIVE ACTION - HONEYWELL REMOVED THE REMAINING DEVICES FROM STOCK. SINCE FAILURE HISTORY HAS REVEALED NO ADDITIONAL FAILURE OR ALERT AGAINST THIS PART, DELIVERED RJDF'S WERE CONSIDERED SATISFACTORY FOR THEIR INTENDED USAGE.

(E) OPERATIONAL USE:

THERE ARE NO CREW ACTIONS TO RECOVER LOSS OF OUTPUT FAILURES. MULTIPLE FAILURES CAUSING LOSS OF SUFFICIENT THRUSTERS FOR MATED COAST/ET SEPARATION WILL REQUIRE A CONTINGENCY AFT ONLY ET SEPARATION TO BE PERFORMED. LOSS OF DUMP CAPABILITY FOR ENTRY MAY REQUIRE REDLINING OF AFT RCS OR OMS PROPELLANT TO MAINTAIN CG WITHIN ACCEPTABLE LIMITS.

- APPROVALS -

EDITORIALLY APPROVED	: RI	: <i>[Signature]</i> 1/24/96
EDITORIALLY APPROVED	: JSC	: <i>[Signature]</i> 2-1-96
TECHNICAL APPROVAL	: APPROVAL FORM	: 95-CIL-004-RI